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ABSTRACT

This paper defines problems of school officials in dealing with the new information society, and suggests a planning framework applicable to the design of school and district microcomputer systems. Educators' problems in addressing the demands and opportunities of the emergent information society include inadequate comprehension of a major shift in societal values and a lack of skills in computer technologies, systems analysis, and planning. Accordingly, a systems-based planning framework is described that might focus school administrators' efforts to conceive and implement a comprehensive microcomputer system. This framework consists of administrative components (purposes, policies, organizational structure, procedures, and feedback control) and computer system components (people, applications, software and supplies, and hardware). This suggested planning framework is illustrated through concrete examples of the application of each of the model's administrative components to its computer components. Seven principal ideas for adapting schools to a computer driven society are summarized at the end. References are included. (TE)

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PLANNING EDUCATIONAL SMALL COMPUTER SYSTEMS

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PLANNING EDUCATIONAL SMALL COMPUTER SYSTEMS

This paper (1) defines problems of school officials in dealing with the new information society; (2) suggests a planning framework for addressing those problems and (3) applies the planning framework to the design of school district microcomputer systems.

Problems

Educators' difficulties in dealing with the demands and opportunities of the emergent information society include poor comprehension of a major shift in societal values, and lack of skills in computer technologies, systems analysis and planning.

Societal Shift

School officials apparently do not realize that we are in civilization's fourth stage of development. They understand mankind's historical progression through the hunting, agricultural and industrial ages. But they apparently do not understand that we have entered a new age, that of an information society. It is born of merged computer and communication technologies. They enable us to produce and to access information easier and more efficiently than ever before (Masuda, 1981; Naisbitt, 1982).

In this new age, we are shifting our emphasis from valuing material productivity to valuing information productivity. Abundantly available information affords new knowledge which promises both personal and institutional self-actualization. "A computer is a tool to enable realization of ideas--as a chisel to

a sculptor, or a palette to a painter" (Robinson, 1983).

The new information society features information utilities that use computers to assemble vast data banks and telecommunications to instantly dispense their information to random inquirers. These electronic utilities promise to enable anyone, anywhere, at any time to obtain desired information easily, quickly and inexpensively.

Lack of Skills

A second problem of school officials is lack of conceptual and technical skills of systems theory, systems analysis, planning, computer technology and communications technology. Most educational administrators' academic preparation programs were devoid of those learning opportunities. And most school officials have not acquired those skills in subsequent inservice learning activities. I briefly characterize below each of these absent abilities among school administrators.

Systems theory illuminates the nature of all purposeful entities, e.g. a computer system. Common elements among systems include (1) environment; (2) boundaries; (3) goal seeking; (4) inputs; (5) processes; (6) outputs; (7) stress; (8) adaptation; (9) feedback and (10) control. Failure to understand and integrate all a system's elements makes impossible a complete system design, or plan.

Systems analysis breaks down complex entities into manageable sets of system parts, in search of optimal arrangements of those parts.

Planning envisions a desired future state and specifies optimal methods for attaining that state.

Computer technology removes the drudgery from writing, calculating and retrieving information. Mental laborers thereby enjoy amplification of their thoughts and augmentation of their creative powers.

Communications technology provides data transmission networks that speed information through an electronic nervous system that ties together institutions and people and coordinates their activities (Laver, 1980).

Plagued by virtual ignorance of our shift to an information society, and by lack of adaptive management skills, educators are fumbling adjustment of their schools to the requirements of this new age. School officials need ideas and guidelines for planning productive uses of small computer systems by pupils and staff.

The remainder of this paper describes a systems-based planning framework that might focus school administrators' efforts to conceive and implement a comprehensive microcomputer system.

A Computer System Planning Framework

Systems analysis, as noted, seeks optimal arrangements of a system's parts. We may divide a computer system, for planning purposes, into two sets of parts, here called components.

Administrative Components

As displayed in Exhibit 1, the administrative components of a comprehensive design for educational microcomputer systems

include:

(1) Purposes
(2) Policies
(3) Organizational Structure
(4) Procedures
(5) Feedback-Control

Each of those administrative components will be defined later at the point of its illustrative application.

Computer System Components

The planning framework's computer system components include:

(1) People
(2) Applications
(3) Software & Supplies
(4) Hardware

People who will be affected by the computer system should participate in its planning, be trained in its operation and be supplied healthful, comfortable (ergonomic) workstations.

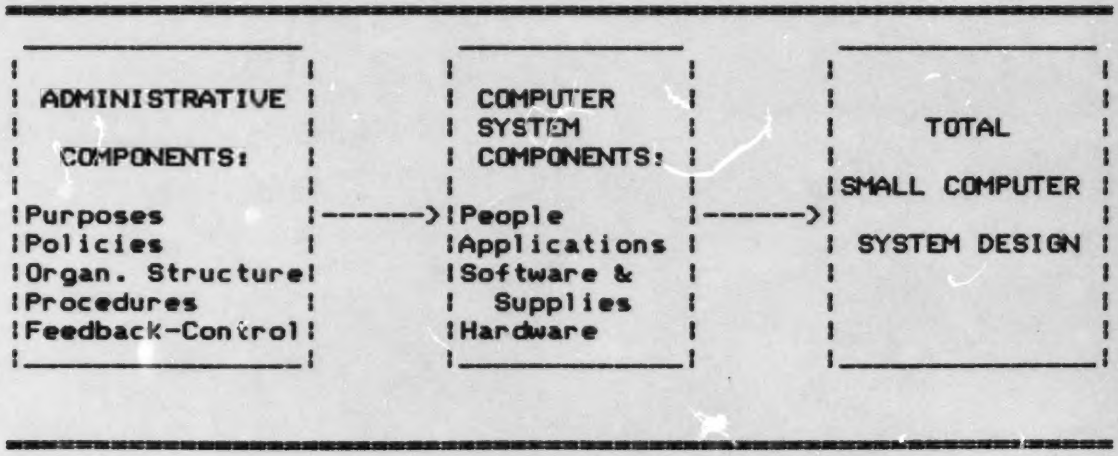
Applications are the jobs people perform on their computers. Examples can include writing English assignments using wordprocessing; analyzing budget trends using an electronic spreadsheet; and retrieving personnel data for staffing analysis using a data base management system.

Software comprises the computer programs needed to run the desired applications. Programs are machine-language procedures that direct the computer's operations.

Supplies include diskettes, diskette file boxes, disk drive cleaners, printer ribbons and printer paper.

Hardware is the computer system equipment needed to run programs. Included are microcomputers, video display terminals (screens), printers and modems for telecommunications between

Exhibit 1: PLANNING FRAMEWORK FOR
EDUCATIONAL SMALL COMPUTER SYSTEMS



computers.

I have listed the computer system components in rank order of their planning importance. What people, will do what jobs, with what software, on what hardware?

Few educators integrate all these components into a complete computer system plan. That is a difficult project to accomplish, but I believe it is feasible.

Action Suggestions

The suggested planning framework is applied here through concrete examples of recommended microcomputer system practices. I will illustrate application of the model's administrative components to its computer system components. The latter will be implied by the examples given.

Purposes

Computer system purposes are expressed as goals and objectives. Both planning techniques can powerfully discipline system direction.

A goal is a continuing purpose that provides a sense of direction over a relatively long time. An objective is a desired, measurable result targeted for accomplishment within a relatively short period. Objectives drive action toward goal attainment. Without them, "muddling through" results.

Goal Example: "We will establish a small computer system to serve as a tool to everyone in the school system." What a challenge! Tool? Yes, defined by each pupil, teacher, support staff person and administrator. A computer can help each individual in his/her work.

Objective Example: "By July 31, 19xx most typists throughout district offices will benefit from wordprocessing." Again, what a challenge! That objective implies reasoned acquisition of effective wordprocessing software, a computer to run the programs, provision of ergonomic work stations, an effective training program and expressed users' happiness with wordprocessing.

If the latter outcome occurs, then cost-effectiveness may be assumed. Redundant typing will have decreased; turn-around-time on typed documents will have decreased; and accuracy of typed documents will have increased, aided by spelling checkers that proofread. Other wordprocessing aids, often overlooked, are grammar checking, footnoting and indexing programs. There is little doubt that any school office without wordprocessing capability suffers from inefficiency.

Policies

A policy is a written statement of preferred action to settle an issue. It guides administrators' decisions when the issue recurs.

Policy Example: "We will fund establishment and development of a district-wide instructional computing subsystem at an annual level of two percent of the total instructional budget." (Moursund, 1984.) That policy statement expresses to a greater degree than usual school board commitment to a desired action course. It demonstrates intent so serious that a planned resource allocation is specified to carry out the intent.

Organizational Structure

An educational computer system's organizational structure is a pattern of unique work functions and related staff positions for applying electronic technologies to learning tasks, office work and administrative decision making.

Organizational Structure Example: Divide the district's envisioned total computer system into three subsystems: (1) the Computer Aided Instruction (CAI) Subsystem; (2) the Computer Aided Office Work (CAO) Subsystem; and (3) the Computer Aided Administration (CAA) Subsystem. Then write a Functions List of up to 12 major, unique work responsibilities for each computer subsystem.

Examples of a function for each subsystem are these:

CAI--Enable pupils in grades 6-12 to use computers to solve problems in all their courses.

CAO--Enable all clerical personnel to use computers in preparing written documents and data tables.

CAA--Enable all administrators to use computers as decision aids.

Next, specify in an organization chart a logical pattern of positions and committees needed to plan and operate the total computer system. Include a district wide computer coordinator, a planning task force, three subsystem coordinators and a key computer resource person in each work unit.

Procedures

A procedure prescribes a series of logical work steps to accomplish a set of tasks.

Examples of Topics for Needed Procedures. Major sets of tasks needing written procedures include:

Planning the Computer System

Procuring Hardware, Software, & Computer Supplies

Training Operators in Each CAO and CAA Application

Providing Security of Hardware, Software & Data Files

Developing Computer Curricula

Evaluating the Computer System

Well designed procedures operationalize objectives and policies. They reduce haphazard work and conserve resources. Without logical procedures, pathways are foggy.

Feedback-Control

No system design is complete without an activity loop that informs a controller of deviations from desired system performance. The controller's task is to adjust system inputs and processes, as necessary, to produce planned outputs.

Retain the district's computer task force that planned the system and assign to it the function of periodically evaluating the total computer system. Additionally, use Stafford Beer's notion of autonomic, i.e. self-regulating, subsystems to require the CAI, CAO and CAA computer subsystems to evaluate and control their own performance (Beer, 1981).

Specify desired performance criteria for your computer system. The criteria may state standards for system inputs and processes as well as outputs. Control the computer system through periodic (at least annual) measurements and reporting of actual vs. expected criteria satisfaction, followed by timely corrective actions.

Evaluative Criteria Examples: Some illustrative criteria for evaluating computer systems are these:

1. Courseware earns its way by delivering at least as much learning value as whatever it replaces (e.g. flash cards or workbooks).
2. Computer users' expectations are satisfied.
3. The school district demonstrates ethical behavior in adhering to a software fair-use policy.
4. Computer system strengths, weaknesses, opportunities and threats are identified and acted on, at least annually (Steiner, 1979).
5. Each administrator has a microcomputer-aided management information system.

Summary

In this paper, I decried school officials' virtual ignorance of a great societal transformation upon us--a shift from an industrial era to an information era. I further noted educators' needs for conceptual and technical guidelines to adapt their systems to the realities of that societal transformation. My remaining remarks summarize principal ideas discussed for adapting schools to a computer driven society.

1. "Inservice" yourself and staff on what consumers need to know about using computers as tools. Don't try to be a computer scientist. Most of them seem to care little about real-world computer applications.

2. Specify a grand goal (dream) for using computers in your school district. Add related, firm objectives, stated in measurable terms and with targeted completion dates. Augment goals and objectives with policies that settle operational issues as they evolve, e.g. committed funding levels for the three

computer subsystems.

3. View your desired computer system holistically, i.e. see all its necessary parts and how they fit. Then plan the organization of a comprehensive, school district computer system. Include subsystems for Computer Aided Instruction (CAI), Computer Aided Office Work (CAO) and Computer Aided Administration (CAA). Most school districts seem ill-focused on CAI and neglectful of CAO and CAA.

4. Write logical procedures for the main task-sets required to implement each computer subsystem. Categories of task-sets include procurement, training, security, curricula development and computer system evaluation.

5. Specify evaluative criteria within each computer subsystem. Design feedback-control loops that inform controllers of system deviations from desired performance and stimulate corrective actions.

6. Sense opportunities to apply each of the Administrative Components (highlighted above) to specific Computer System Components. The latter comprise People, Applications, Software/Supplies and Hardware.

7. Rejoice that you are among the first educators to plan a comprehensive school district microcomputer system!

A board of education should require a computer system master plan, similar in scope to the model suggested here, before authorizing computer expenditures. Failure to chart a clear course in responding to the information ages's demands of schools is fiscally and educationally imprudent.

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